Journal of Experimental Social Psychology 127 (2026) 104965

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

Willful ignorance in the context of antibiotic prescribing☆,☆☆

Alina Schneider [a,*], Miroslav Sirota [b], Rian Gross [a], Lars Korn [c,d], Elisabeth D.C. Sievert [e,d,c], Cornelia Betsch [d,c], Robert Böhm [a,f]

[a] Faculty of Psychology, University of Vienna, Universitätsstraße 7, 1010 Vienna, Austria
[b] Department of Psychology, University of Essex, Wivenhoe Park, Colchester, CO4 3SQ, United Kingdom
[c] Health Communication, Implementation Research, Bernhard Nocht Institute for Tropical Medicine, Bernhard-Nocht-Straße 74, 20359 Hamburg, Germany
[d] Health Communication, Institute for Planetary Health Behaviour, University of Erfurt, P.O. Box 90 02 21, 99105 Erfurt, Germany
[e] Patient-Reported Outcomes, Institute for Health Services Research in Dermatology and Nursing, University Medical Center Hamburg-Eppendorf, Martinistraße 52, 20251 Hamburg, Germany
[f] Department of Banking and Finance, University of Innsbruck, Universitätsstraße 15, 6020 Innsbruck, Austria

A R T I C L E I N F O

Keywords:
Moral wiggle room
Antibiotic use
Willful ignorance
Information avoidance
Prescription behavior

A B S T R A C T

Healthcare professionals tend to overprescribe antibiotics despite knowing the risks of antibiotic resistance. This tendency, amplified under diagnostic uncertainty and patient pressure, suggests that mechanisms beyond lack of risk awareness or knowledge sustain overprescription. One such mechanism may be willful ignorance – deliberately avoiding information about the consequences of one's prescribing decisions. By allowing healthcare professionals to justify immediate antibiotic prescribing that prioritize short-term self-interests over long-term collective benefits, willful ignorance may contribute to persistent overprescribing. Despite its practical relevance, willful ignorance has not yet been investigated in the context of antibiotic prescribing. To test this empirically, we conducted two preregistered online experiments with healthcare professionals from the United States and the United Kingdom. Participants completed an adapted version of the Moral Wiggle Room Task, a behavioral decision-making paradigm designed to investigate willful ignorance. This task compares choices across a full information condition with diagnostic certainty, and a hidden information condition with diagnostic uncertainty that can be voluntarily reduced. In Experiment 1 (N = 698), healthcare professionals were more likely to prescribe antibiotics immediately in the hidden vs. full information condition, supporting the presence of willful ignorance. In Experiment 2 (N = 150), making the collective consequences of antibiotic prescribing for antibiotic resistance salient substantially reduced willful ignorance. These results highlight the role of willful ignorance in antibiotic prescribing and point to practical implications: promoting transparent environments and communicating the collective consequences of antibiotic use may help support more appropriate antibiotic prescribing decisions.

Antibiotic resistance is one of the most pressing global health threats to date (World Health Organization, 2023). It is projected to contribute to more than 39 million deaths in the next 25 years (Naghavi et al., 2024). The emergence and spread of antibiotic resistance is largely driven by human behavior through mis- and overuse of antibiotics across different sectors (World Health Organization, 2023).

Within the healthcare sector, particularly in primary and acute care, professionals play a critical "gatekeeping role with antibiotics" (Roope et al., 2019, p. 4). When patients show signs or symptoms of an infection, it is the responsibility of healthcare professionals to determine whether an antibiotic prescription is appropriate. A considerable amount of patients are treated with antibiotics when not evidenced, such as inappropriate use in cases of non-bacterial (e.g., viral) infections (Carrara et al., 2018). Definitive evidence of the appropriate treatment decision is frequently lacking before obtaining the results of antimicrobial susceptibility testing – a laboratory procedure that usually takes a minimum of two days (Bayot & Bragg, 2024; Reszetnik et al., 2024).

☆ This article is part of a Special issue entitled: 'Current Directions in Social Dilemmas Research' published in Journal of Experimental Social Psychology.
☆☆ This paper has been recommended for acceptance by Shuxian Jin.

* Correspondence to: Department of Occupational, Economic, and Social Psychology, Faculty of Psychology, University of Vienna, Universitätsstraße 7, 1010 Vienna, Austria.

E-mail addresses: alina.katharina.schneider@univie.ac.at (A. Schneider), msirota@essex.ac.uk (M. Sirota), rian.marina.gross@univie.ac.at (R. Gross), lars.korn@bnitm.de (L. Korn), elisabeth.sievert@uni-erfurt.de (E.D.C. Sievert), cornelia.betsch@uni-erfurt.de (C. Betsch), robert.boehm@univie.ac.at (R. Böhm).

https://doi.org/10.1016/j.jesp.2026.104965
Received 12 August 2025; Received in revised form 20 May 2026; Accepted 16 June 2026
Available online 25 July 2026

The overprescription of antibiotics represents a complex and multifaceted issue, with diagnostic uncertainty regarding the nature of the infection (e.g., Cals et al., 2007; Macfarlane et al., 1997) and patient pressure to receive antibiotics (e.g., Cole, 2014; Sirota et al., 2017) identified as key determinants. In situations of diagnostic uncertainty, healthcare professionals must choose between prioritizing short-term individual interests in administering antibiotics immediately and long-term collective-benefits in delaying or restraining antibiotic prescribing until further diagnostics reduce uncertainty, rendering antibiotic prescribing a social dilemma (Krockow et al., 2022). The benefits of immediate prescribing subsume both their own as well as their current patients' interest (Krockow et al., 2022). Acting as their agent, healthcare professionals may myopically consider the best interest of their current patient in the decision-making process, disregarding the effects for future patients. Following, immediate antibiotic prescribing may offer short-term benefits for healthcare professionals by meeting patient expectations and, ideally, being justified in hindsight if the treatment proves appropriate; possibly circumventing patient litigations later on (Krockow et al., 2023). Healthcare professionals may further benefit by avoiding the risk of patient deterioration and in fulfilling their professional duty, such as referring to ethical imperatives (Krockow et al., 2022). However, immediate prescribing also carries the risk of inappropriate use, which accelerates antibiotic resistance and threatens both individual patient outcomes and public health in the long term. At the level of the individual patient, immediate prescribing in cases of non-bacterial infections might yield the benefit of fulfilled expectations, leading to increased satisfaction. Unnecessary antibiotic use for the patient, however, is associated with disruptions in the microbiota, (Anthony et al., 2022), inter alia, leading to several other diseases (Hou et al., 2022), and even bacterial resistance in the individual patient (Costelloe et al., 2010), posing substantial costs for the patient. Finally, at the societal level, depleting antibiotic effectiveness and accelerating antibiotic resistance through the prescription of unnecessary antibiotic use comes at great costs, exemplified by high estimated mortality (Naghavi et al., 2024) and economic burden (McDonnell et al., 2024).

Restrained prescribing on the other hand can pose challenges for healthcare professionals, including the risk of patient deterioration, pressure and expectations from patients, and the need to justify their decision – potentially in contrast to colleagues' choices (see e.g., Cole, 2014; Krockow et al., 2019). Nonetheless, delaying antibiotic prescribing reduces unwarranted antibiotic consumption (Murphy et al., 2024) and helps to preserve the long-term effectiveness of antibiotics, benefiting the broader collective and public health through antibiotic stewardship (Hibbard et al., 2024).

Making appropriate antibiotic treatment decisions depends on reducing diagnostic uncertainty regarding the nature of the infection (Goldschmidt et al., 2025). Patient pressure has been shown to increase antibiotic prescribing, even when the physician's perceived likelihood of the infection being bacterial remained unchanged (Sirota et al., 2017). This indicates that other psychological mechanisms are at play to justify immediate prescribing. Some healthcare professionals may intentionally avoid seeking diagnostic information prior to making their treatment decision. Deciding to be willfully ignorant of the appropriateness of their prescribing decision can help maintain a positive self-image (Grossman & van der Weele, 2017) or reduce cognitive dissonance (Matthey & Regner, 2011).

Despite its potential relevance to the issue of overprescription, willful ignorance has not yet been investigated in the context of antibiotic prescribing. To address this gap, we employed a well-established behavioral paradigm with monetary incentives to examine the influence of willful ignorance on decision-making in this critical real-world setting across two experiments. To enhance ecological validity, we recruited healthcare professionals to serve as decision-makers in our experiments. Before detailing our methods, we first review the relevant literature.

Related literature

In certain cases, people intentionally choose to avoid learning about particular information (Sweeny & Howell, 2025). This phenomenon, broadly defined as *information avoidance*, encompasses "any behavior intended to prevent or delay the acquisition of available but potentially unwanted information" (Sweeny et al., 2010, p. 341). *Willful ignorance* is a deliberate and strategic form of information avoidance, aimed at actively avoiding information about the potential negative consequences of one's behavior or decision (Dana et al., 2007; Grossman & van der Weele, 2017; Vu et al., 2023).[1] Willful ignorance can arise in social dilemma contexts where individuals face decision-making conflicts, such as the tension between short-term self-interest and long-term collective benefits. By intentionally avoiding information about the potential negative consequences of self-interested behavior, individuals create a moral wiggle room that enables them to preserve a positive self-image (Grossman & van der Weele, 2017).

To investigate how people navigate conflicting choices when given the option to avoid learning about the impact of their actions on others, Dana et al. (2007) developed the Moral Wiggle Room Task, which has become a commonly used behavioral game measure of willful ignorance (for an overview, see Vu et al., 2023). In this task, participants play an adapted version of the binary dictator game, in which a decision-maker decides between two payoff options that determine the allocated money for themselves and for a recipient. In this task, a full and a hidden information condition are contrasted. In the full information condition, decision-makers face a state of conflict (i.e., misaligned interests of the decision-maker and the recipient) and are presented with two options: a cooperative choice – sacrificing personal payoffs to benefit the recipient – and a non-cooperative choice – maximizing personal payoffs at the expense of the recipient. In the hidden information condition, decision-makers are again presented with two options. However, they are only aware of the associated payoffs for themselves; the external consequences for the recipient are initially hidden. Decision-makers are informed that there is an equal probability of being in a state of conflict or in a state of alignment (i.e., aligned interests of the decision-maker and the recipient). Importantly, before they make their decision, decision-makers can choose to (i) reduce uncertainty by voluntarily revealing information about their state, and thus the associated recipient's consequences of each choice, or (ii) to remain willfully ignorant.

A recent meta-analysis on studies using this experimental paradigm (Vu et al., 2023) demonstrated that almost 40% of people willfully avoided information about the impact of their decisions on others, reducing cooperative choices by 15.6 percentage points compared to when information about external consequences was given exogenously. In addition, cooperative choices were found to be 6.9 percentage points higher when people self-selected to voluntarily acquire information about the impact of their decisions on others compared to when this information was imposed on them; a phenomenon referred to as *sorting* (Grossman & van der Weele, 2017) because participants actively sort themselves into this informational state.

To investigate willful ignorance in the context of antibiotic prescribing, we adapted the Moral Wiggle Room Task (Dana et al., 2007). A primary advantage of this methodological approach is that it allows for the causal identification of willful ignorance by linking it directly to people's behavior under incentive conditions, making their decisions consequential (Thielmann et al., 2021[2]). The contextualized

[1] It is important to note that taxonomically, information avoidance represents a broader concept. Willful ignorance can be classified as a strategic tool; theorized to fulfill various functions, including avoiding moral responsibility and mitigating liability (Hertwig & Engel, 2016; for information avoidance in the context of antibiotic resistance, see e.g., Meerza et al., 2021).

[2] For other research utilizing behavioral games in different domains related to antibiotic decision-making, see e.g., Böhm et al., 2022; Santana et al., 2023, 2024.

setting simulated an environment in which healthcare professionals experience tensions between diagnostic uncertainty, patient demands, and public health responsibilities. In the experimental setup, healthcare professionals took the role of decision-makers; individuals from the general population served as recipients (i.e., patients). Diagnostic uncertainty was modeled by comparing a full information condition, in which the state of the world including the associated consequences of each treatment option were transparent, with a hidden information condition, in which healthcare professionals first chose whether to reveal this information before making their decision. In the context of antibiotic prescribing, restraining antibiotic prescribing to prioritize long-term collective public-health interest over healthcare professionals' short-term self-interest can be considered a cooperative choice that benefits both the individual patient through optimized care and society at large. In contrast, non-cooperative immediate prescribing mirrors the situation when healthcare professionals prioritize their short-term self-interest at the expense of both individual patients' and collective benefits. Willfully avoiding information that would reduce diagnostic uncertainty can provide justification for non-cooperative immediate antibiotic prescribing.

1. Experiment 1

Based on the meta-analytical findings, we hypothesized the following:

Willful Ignorance Hypothesis: Healthcare professionals make more choices to restrain prescribing with diagnostic certainty by default (i.e., full information condition; exogenously determined) compared to diagnostic uncertainty by choice (i.e., hidden information condition; endogenously determined).

Sorting Hypothesis: Healthcare professionals who actively choose to reduce diagnostic uncertainty (i.e., reveal information in the hidden information condition; endogenously determined) will make more choices to restrain prescribing than those who receive diagnostic certainty by default (i.e., full information condition; exogenously determined).

1.1. Method

1.1.1. Participants

The study received ethical approval by the Institutional Review Board of the University of Vienna, Department of Occupational, Economic, and Social Psychology (reference no. 2025/W/006). All participants provided informed consent. The study involved no deception of participants.

We conducted a preregistered a-priori power analysis using the *pwrss* package (Bulus & Jentschke, 2025). For the *Willful Ignorance Hypothesis*, we used a χ^2 test, assuming a proportion of restrained prescribing choices in the full information condition of 57% and 38% in the hidden information condition (based on Vu et al., 2023), with α = .05 and power = .9. For the *Sorting Hypothesis*, we used a χ^2 test, assuming a proportion of restrained prescribing choices in the full information condition of 57% and 69% in the hidden information condition (based on Vu et al., 2023), with α = .05 and power = .9. Based on this, we recruited 700 healthcare professionals working as doctors or nurses within medicine/healthcare for the role of the decision-maker. To avoid deception and ensure payment, 70 participants from the general public were recruited for the role of the recipient (for a more detailed description of the study participants, see Table S1 in the supplementary material, for measures and results, see supplementary material). All participants were equally balanced between the United Kingdom and the United States, and were recruited via Prolific.

Data were collected between March and May 2025. According to our preregistered exclusion criteria, two participants were excluded. Thus, the final sample of participants in the role of healthcare professionals resulted in N = 698 participants, aged between 18 and 85 years (M_{age} = 38.77 years, SD_{age} = 12.62). Approximately 72% of the participants identified as women, 26% as men, and about 1% as non-binary or other; almost 50% had completed a bachelors degree; about 31% worked as doctors and 69% as nurses ranging from 1 to 49 years of practice ($M_{years\ of\ practice}$ = 14.44 years, $SD_{years\ of\ practice}$ = 10.12), and 56% reported having the authority to prescribe antibiotics in their current professional role (for a more detailed description of the study participants, see Table S2 in the supplementary material).

1.1.2. Behavioral paradigm and experimental conditions

Willful ignorance was assessed using an adapted version of the Moral Wiggle Room Task (Dana et al., 2007, see Fig. 1). Healthcare professionals were instructed to take on the role of a doctor and read the following fictitious scenario: in a primary care unit, a patient exhibits symptoms indicative of an infection, but the underlying pathology remains inconclusive. The patient's symptoms could be caused by either a bacterial or a non-bacterial pathogen. The healthcare professional must choose between (i) prescribing antibiotics immediately (*immediate prescribing*) or (ii) delaying or restraining antibiotic treatment to monitor the symptoms or carrying out more complex diagnostics (*restrained prescribing*). Each choice was associated with different consequences and outcomes for both the healthcare professional and the patient, illustrated by the payoffs in the game (numbers in the cells; Fig. 1) and the narrative rationales provided alongside the payoffs (see Fig. 2). Payoff for each option remained constant across all conditions for healthcare professionals; only the patient's payoffs varied.

The game used a between-participants design with three experimental conditions varying diagnostic uncertainty and the likelihood of a bacterial infection: (i) full information, (ii) hidden information – state of conflict, (iii) hidden information – state of alignment. In the full information condition with diagnostic certainty, healthcare professionals were provided with full information about the low likelihood of a bacterial infection and the according patient's consequences of each treatment option. That is, in the full information condition, healthcare professionals always faced a state of conflict between their short-term interest and long-term benefits. In the hidden information condition, diagnostic uncertainty was present. Thus, healthcare professionals were initially unaware of the patient's consequences associated with each treatment option and could face either a state of conflict (low likelihood of bacterial infection) or a state of alignment (high likelihood of bacterial infection, aligning self- and other-related interests). Healthcare professionals were randomly assigned to one of the three conditions, which are described in detail below.

Healthcare professionals were informed that 10% of them would be randomly selected for a bonus payment, with the amount depending on their decisions in the game. Accordingly, 70 participants from the general population were sampled as recipients (i.e., patients), receiving the payoff determined by the healthcare professional's decision. Healthcare professionals and patients were randomly and anonymously paired. The experiment was programmed in SoSci Survey (Leiner, 2024).

Full information condition. In the full information condition, healthcare professionals were always in a state of conflict and information about the consequences of each treatment decision was provided exogenously. Based on the patient's symptoms, there was a low likelihood for the infection being bacterial, creating a misalignment between the short-term interest of the healthcare professional in meeting patient expectations and reputational concerns, and the long-term benefit in optimized patient care and maintaining public health interests through mitigating antibiotic resistance.

This conflict was modeled using a binary dictator game with monetary incentives: Option A (immediate prescribing) yielded £7 for the healthcare professional, while the patient received £1. In contrast, Option B (restrained prescribing) represented the joint-maximum choice with the best possible collective outcome (i.e., preserving the effectiveness of antibiotics), providing £5 to both the healthcare professional

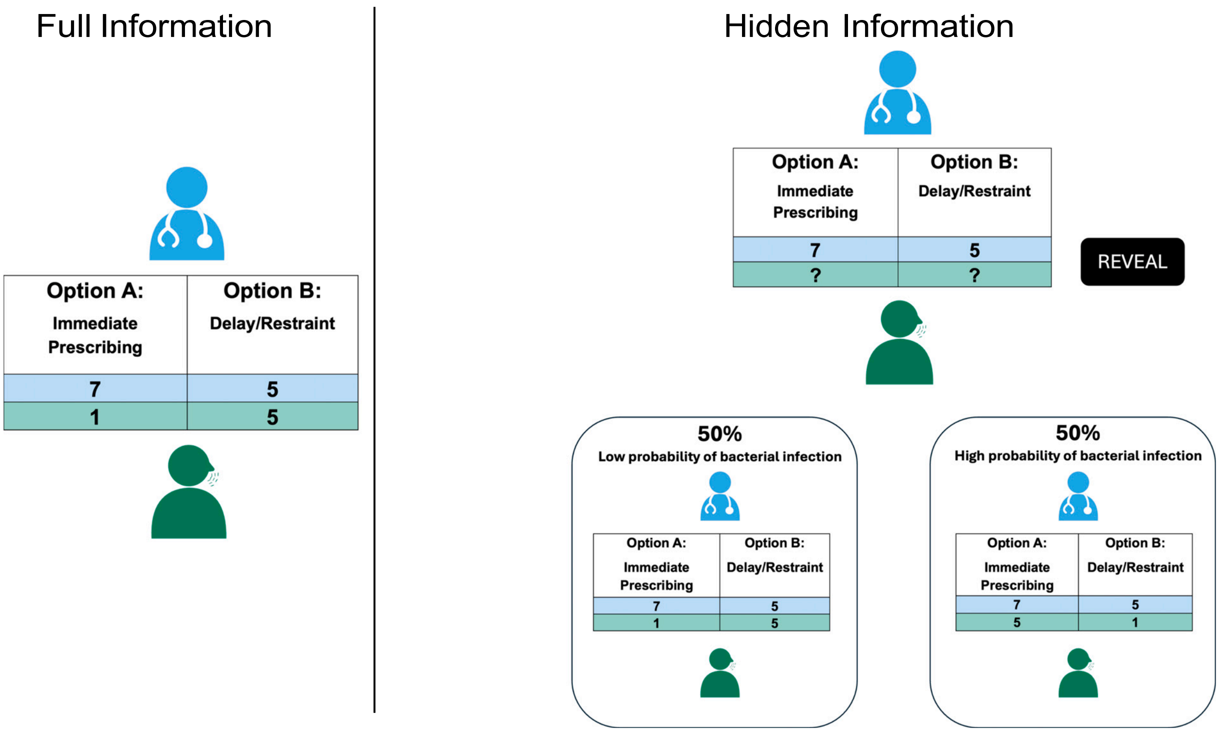

Fig. 1. Illustration of the experimental setup and payoff structure.
Note. Healthcare professionals took the role of a doctor (blue figure with stethoscope) in a primary care unit, where a patient (green figure with infection droplets) presents with symptoms of an infection, but with inconclusive evidence of the underlying pathology. Healthcare professionals were presented with two choices: To prescribe antibiotics immediately or restrain prescribing. Each choice was associated with different consequences, represented by the payoffs (numbers in the table). In the full information condition (left), participants always faced a state of conflict (i.e., low likelihood of bacterial infection; misaligned interests of the healthcare professional and the patient). In the two hidden information conditions (right), participants were informed that there was a 50% chance of being in the state of conflict (i.e., low likelihood of bacterial infection; misaligned interests of the healthcare professional and the patient) or in the state of alignment (i.e., high likelihood of bacterial infection; aligned interests of the healthcare professional and the patient). In the hidden information conditions, healthcare professionals could reveal diagnostic information about the state of the world at no cost. Without revealing this information, healthcare professionals were only shown the payoff matrix with question marks as input for the payoff for the patients.

and the patient. The ordinal difference for the payoffs between immediate or restrained prescribing maps onto the benefit of optimized patient care, such as better treatment outcomes and reduced risk of antibiotic resistance for the individual patient (Costelloe et al., 2010) and the society at large (World Health Organization, 2023).

Hidden information conditions. In the hidden information conditions, healthcare professionals were initially informed only of the payoffs associated with each option for themselves (Fig. 1): £7 for immediate prescribing, i.e., Option A, and £5 for restrained prescribing, i.e., Option B. This is equivalent to the full information condition. Unlike in the full information condition, however, healthcare professionals faced diagnostic uncertainty and were unaware of the corresponding patient outcomes associated with either treatment option. Healthcare professionals were told that, based on the patient's symptoms, the likelihood of a bacterial infection was equally likely to be low or high (50% each).

In the hidden information – state of conflict condition, there was a low likelihood of a bacterial infection. Equivalent to the full information condition, Option A (immediate prescribing) yielded £1 for the patient, while Option B (restrained prescribing) yielded £5, simulating the conflict between the short-term interest of the healthcare professional and the patient's long-term benefit. In the hidden information – state of alignment condition with a high likelihood of a bacterial infection, the patient outcomes were reversed: Option A (immediate prescribing) yielded £5 and Option B (restrained prescribing) yielded £1 for the patient, aligning the interests of both parties.

Healthcare professionals could choose to reduce diagnostic uncertainty by actively revealing the associated patient payoffs with each treatment decision at no cost. By revealing this information, healthcare professionals learned whether the likelihood of a bacterial infection was low (state of conflict; equivalent to the full information condition) or high (state of alignment). This reflected the decision to pursue more advanced diagnostic testing. Information acquisition was endogenous, meaning that healthcare professionals could self-select to become informed or remain ignorant before making their treatment decision.

1.1.3. Measures

The primary outcome was the proportion of healthcare professionals choosing restrained prescribing in the behavioral game. Several secondary variables were recorded: salience of antibiotic resistance (single item: "Please indicate how prominent the topic of antibiotic resistance is during your daily work", ranging from 1 = *not at all prominent* to 5 = *highly prominent*), threat perception of antibiotic resistance (single item: "Antibiotic resistance is a serious health threat", ranging from 1 = *strongly disagree* to 5 = *strongly agree*), prescription authority (single item: "Do you have the authority to prescribe antibiotics in your current role?", categorical, *yes* vs. *no*), years of practice ("Please specify the years of practice within the medicine/healthcare sector", continuous variable).

Additionally, we asked participants from the general population who took the role of patients for their beliefs about (i) the proportion of healthcare professionals choosing restrained prescribing in the full information condition, (ii) the proportion of healthcare professionals revealing the information in the hidden information condition, and (iii) the proportion of healthcare professionals choosing restrained prescribing in the state of conflict conditional on having revealed the

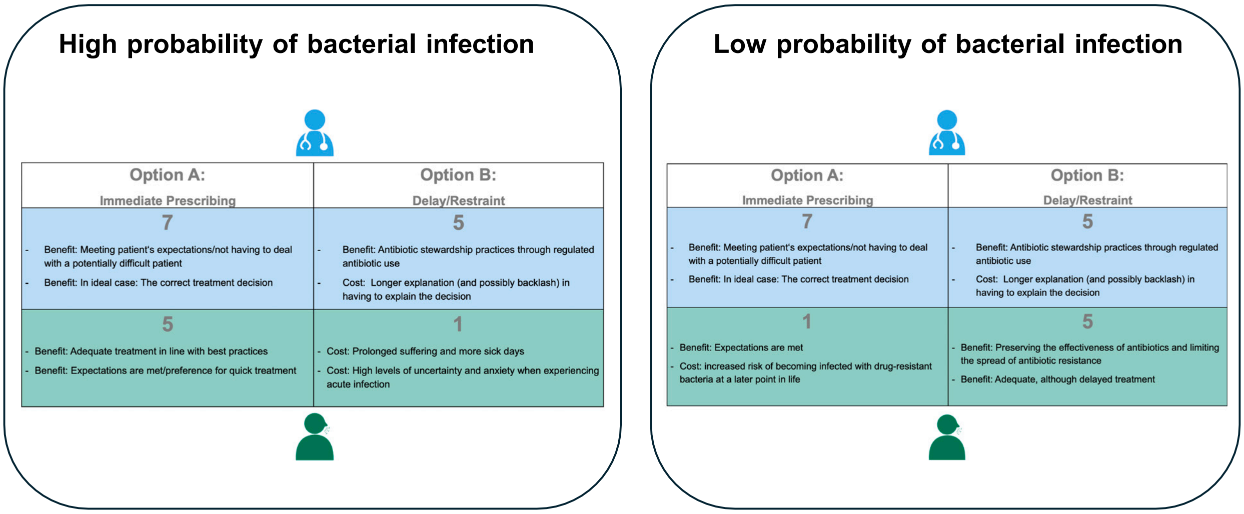

Fig. 2. Illustration of the narrative rationales provided alongside payoffs.
Note. (Left) State of alignment. (Right) State of conflict. The narrative rationales for the point allocations and associated payoffs were presented to participants alongside the payoff matrices. Rationales were selected based on perceived plausibility in a pretest.

information in the hidden information condition. Using the interval method (see Charness et al., 2021), participants from the general population earned a fixed reward of £0.5 for each estimate within 5 percentage points of the true proportion (for measures and results, see supplementary material).

1.1.4. Procedure

The ordinal payoff structure of the behavioral game was equivalent to that of Dana et al. (2007). Payoffs were presented as points, and participants were informed that the points were equal to pounds (1 point = £1). To prepare the materials for the experiments, we conducted a pretest to assess the perceived plausibility of different narrative rationales for point allocations and associated payoffs with a separate sample of $N = 100$ healthcare professionals from the United Kingdom ($n = 50$) and the United States ($n = 50$). Final rationales were selected based on perceived plausibility and presented to participants alongside the payoff matrices (for further details, see supplementary material and OSF).

At the start of the study, all participants provided informed consent and completed a sociodemographic questionnaire. They were then introduced to the game procedure and completed a brief trial using a generic payoff matrix to ensure comprehension of the task and the payoff structure (for instructions and materials, see OSF). After reading the fictional scenario, healthcare professionals were randomly assigned to one of three experimental conditions. They were then shown the actual payoff matrices and asked to make their decision. After reading the scenario, participants from the general population were first asked for their beliefs about healthcare professionals' decisions before being informed about their role as the patient (i.e., recipient).

1.2. Results

Only 24% of healthcare professionals prescribed antibiotics immediately in cases of diagnostic certainty and available information about the consequences of their treatment decision from the onset. In contrast, in cases of diagnostic uncertainty and healthcare professionals choosing not to reduce it, 57% opted for immediate prescribing. This shows that willful ignorance about the consequences of treatment decisions leads to more frequent immediate antibiotic prescribing (see Fig. 3). When healthcare professionals actively chose to reduce diagnostic uncertainty about the likelihood of a bacterial infection, 42% prescribed antibiotics immediately; less than when ignoring the consequences of one's action but more than when being presented with diagnostic certainty by default.

1.2.1. Preregistered analyses

As preregistered, willful ignorance was investigated by comparing the fraction of choices to restrain prescribing in the full information condition to the corresponding fraction of choices in the hidden information condition (including observations from the state of conflict and state of alignment). Supporting the *Willful Ignorance Hypothesis*, choices to restrain prescribing differed significantly across experimental conditions, $\chi^2(1) = 40.43$, $p < .001$, $OR = 4.04$, 95% CI [2.62, 6.23] (Fig. 3A, full information vs. hidden information), indicating that the odds of healthcare professionals restraining antibiotic prescribing were about four times higher in the full information condition (76%, 174 out of 230 participants) as opposed to in the hidden information condition (43%, 70 out of 161 participants). As robustness checks, we ran additional analyses excluding all states of alignment in the hidden information condition (for this approach, see e.g., Dana et al., 2007). As a further robustness check (not preregistered), we fitted a logistic regression model to predict the probability of choices to restrain prescribing from ambiguity (hidden information condition, including observations from the state of conflict and state of alignment when ignoring information vs. full information condition), including several covariates. The results corroborated the robustness of our finding (for details, see Table S5 in supplementary material). Healthcare professionals were more likely to restrain prescribing when they were involuntarily informed of the consequences of their treatment decision for the patient, compared to when they neither received nor sought out such information.

When facing initial diagnostic uncertainty in the hidden information condition, 66% (307 of 468 participants, pooled across state of conflict and state of alignment) of healthcare professionals decided to reveal the information. That is, they sought further diagnostic information on the likelihood that the infection was bacterial. But does the endogenous decision to reduce diagnostic uncertainty influence the subsequent prescribing decision? To examine the preregistered sorting effect, we compared the proportion of choices to restrain prescribing when choosing to reveal information in the hidden information condition (only in the state of conflict) to the proportion of such choices in the full information condition. Our results provide no support for the *Sorting Hypothesis*. Healthcare professionals who actively revealed diagnostic information did not immediately prescribe antibiotics less often than those who received the information by default. To the contrary, results revealed that healthcare professionals in the full information condition made more choices to restrain prescribing (76%, 174 out of 230 participants) than those who voluntarily sought diagnostic information and revealed a state of conflict[3] (58%, 86 out of 148 participants), $\chi^2(1) = 12.11$, $p < .001$, $OR = 2.24$, 95% CI [1.44, 3.49] (Fig. 3A, full information vs. revealed information). In a state of conflict, the likelihood of restraining prescription was more than two times higher in the full information condition as opposed to when having voluntarily reduced diagnostic uncertainty in the hidden information condition.

1.2.2. Exploratory analyses

Results from exploratory sorting analyses showed that healthcare professionals who revealed information in the hidden information condition subsequently made more choices to restrain prescribing in the state of conflict (58%, 86 out of 148 participants) than those who willfully ignored this information (43%, 70 out of 161 participants, including observations from the state of conflict and the state of alignment), $\chi^2(1) = 6.03$, $p = .014$, $OR = 1.80$, 95% CI [1.15, 2.83] (Fig. 3A, hidden information vs. revealed information). In other words, the likelihood to restrain prescribing was 80% higher when healthcare professionals voluntarily chose to reduce diagnostic uncertainty than when they chose to remain ignorant.[4]

To explore the role of secondary variables on cooperative choices, we conducted a multiple logistic regression (1 = restrained prescribing, 0 = immediate prescribing). For this analysis, we used observations from the full information condition, observations from both states of the world when information was ignored in the hidden information condition, and observations from the state of conflict when information was revealed in the hidden information condition (see Table S6). We found a significant effect of survey country on prescribing decision ($OR = 0.53$, 95% CI [0.35, 0.79], $p = .002$), indicating that healthcare professionals from the United States were less likely to restrain prescribing than healthcare professionals from the United Kingdom. Results further revealed a significant effect of threat perception of antibiotic resistance ($OR = 1.72$, 95% CI [1.31, 2.27], $p < .001$): Higher levels of threat perception increased the odds of restrained prescribing. No other secondary variable significantly predicted the likelihood of cooperative choices.

In addition, we applied a multiple logistic regression to examine the influence of secondary variables on information avoidance (1 = ignore information, 0 = reveal information). Observations from both hidden information – state of conflict and hidden information – state of alignment were included, as participants were unaware of the consequences of their treatment choice prior to reducing diagnostic uncertainty. Here, no secondary variable significantly predicted the likelihood of information avoidance (for more details, see Table S7; for correlations, see Table S4 in supplementary material).

1.3. Discussion

In Experiment 1, we found that when provided with diagnostic certainty by default, healthcare professionals significantly restrained prescribing of antibiotics more than when initial diagnostic uncertainty was provided. These results highlight the role of willful ignorance in antibiotic prescribing and emphasize the need for reduced diagnostic uncertainty in healthcare contexts from the outset.

There are two major limitations of the study that should be noted. First, we operationalized the social dilemma of antibiotic prescribing by incorporating the negative social externalities of antibiotic use into the patients' utility. While this design choice permitted a simplified, cognitively less taxing version of the game, it came at the cost of a less accurate representation of the real world. In fact, receiving (or not receiving) an antibiotic prescription can entail benefits and costs for the individual patient, while the broader social externalities of antibiotic use are borne collectively: increased antibiotic use accelerates antibiotic resistance and affects society as a whole. These societal consequences may be less salient to decision-makers. To address this, in Experiment 2 we modeled the consequences for the patient and for society separately, thereby increasing the salience of the latter.

Second, we did not assess participants' ex post reasoning for their prescribing decisions, which limits our ability to further clarify the psychological reasons underlying their choices. To extend on this, in Experiment 2 we elicited participants' post-decision reasoning.

2. Experiment 2

To build on the findings of Experiment 1, we devised a more complex incentive structure of the behavioral task to more closely model the real-world social dilemma structure. To this end, Experiment 2 explicitly models the social externalities of antibiotic use, that is, the costs borne by society (i.e., all participants, including patients and healthcare professionals). With these adaptations, we again hypothesized to find the effect of willful ignorance in the adapted version of the game (*Willful Ignorance Hypothesis*, see Experiment 1).

2.1. Method

2.1.1. Participants

Ethical approval was received by the Institutional Review Board of the University of Vienna, Department of Occupational, Economic, and Social Psychology (reference no. 2026/W/006). We obtained informed consent from all participants at the beginning of the study. Participants were not deceived.

The targeted sample size was based on a preregistered a-priori power analysis with the package *pwrss* (Bulus & Jentschke, 2025). Based on the results from Experiment 1 (i.e., proportion of restrained prescribing in full information condition: 76%, proportion of restrained prescribing in hidden information condition: 43%), at least 94 participants are needed to detect the willful ignorance effect with α = .05 and power = .9. In Experiment 1, 66% of healthcare professionals revealed information in the hidden information conditions; participants who reveal information will not be included in the analysis of the hypothesis. To account for these potential exclusions, we recruited 31 additional participants. Oversampling the resulting sample size by ∼20% to account for potential differences in information acquisition rates and attrition yielded a final targeted sample size of 150 healthcare professionals. As in Experiment 1, we selected 10% of the decisions for payout, resulting in an additional sample of 15 patients from the general population.

Data for the study were collected in February 2026 via the online panel company Prolific. The final sample comprised N = 150 participants, recruited among healthcare professionals who already participated in Experiment 1 (see Procedure for details). Age of the participants ranged between 22 and 70 years (M_{age} = 42.4 years, SD_{age} = 12.5), with 76% identifying as woman, 22% as man, and 2% as non-binary. In terms of educational attainment, over 50% of participants reported to have completed a bachelors degree, and 48% as having the authority to prescribe antibiotics (see Table S3 in supplementary material). No participant was excluded due to suspicion of bot activity.

2.1.2. Behavioral paradigm and experimental conditions

The experimental setup of the Moral Wiggle Room Task was equivalent to Experiment 1, with the difference that each choice to use antibiotics resulted in collective costs of 0.02 points (£0.02) to all players in the game (for a similar procedure, see Santana et al., 2023).

[3] Please note that observations from the state of alignment after revealing were excluded, as they do not provide a meaningful comparison to the full information condition due to the absence of conflict between the interests of the healthcare professional and the patient.

[4] This effect was robust when including only observations from the state of conflict, $\chi^2(1) = 9.26$, $p = .002$, $OR = 2.42$, 95% CI [1.40, 4.18].

This means that all players lose 0.02 points each time antibiotics are used (i.e., Option A; immediate prescribing is chosen) by any dyad in the game, representing antibiotic resistance. In the case of all healthcare professionals choosing to immediately prescribe antibiotics in the game, the collective costs add up to 3 points (£3). Importantly, this total cost is greater than the individual gain (2 points for the healthcare professional; £2) for a healthcare professional when choosing immediate prescribing (7 points for the healthcare professional; £7) instead of restrained prescribing (5 points for the healthcare professional; £5). Nevertheless, the healthcare professionals' payoff-maximizing strategy is to prescribe antibiotics, illustrating the social dilemma in the game structure.

In the experiment, again two modes were possible: full information condition with diagnostic certainty and hidden information conditions with diagnostic uncertainty. In all conditions, healthcare professionals were informed about their own payoffs associated with either choice and about the collective costs associated with immediate prescribing (see above). Equivalent to Experiment 1, healthcare professionals only knew about the patient's payoff associated with either choice in the full information condition. In the hidden information conditions, healthcare professionals faced diagnostic uncertainty, and were informed that they may be in either a state of conflict or a state of alignment and could choose to reveal information about their state. To investigate repeated decision-making, participants were assigned to the same information condition they were assigned to in Experiment 1. In the hidden information condition, participants were randomly assigned to a state of conflict or state of alignment with a probability of 50% using an in-built randomizer from SoSci Survey.

2.1.3. Measures

The primary outcome of Experiment 2 was the proportion of healthcare professionals who chose to restrain prescribing in the behavioral game. In addition to recording socio-demographic variables, participants were asked about their prescription authority (binary choice; yes vs. no) and their threat perception of antibiotic resistance (single item: "Antibiotic resistance is a serious health threat", ranging from 1 = *strongly disagree* to 5 = *strongly agree*).

After making their decision, participants were asked for their reasoning for their prescribing decision. All 150 open-ended responses were coded by two independent raters. The inter-rater reliability was substantial (κ = .65).

2.1.4. Procedure

All participants who had previously taken part in Experiment 1 were invited to participate in Experiment 2. We chose to recruit from the same sample as in the first study for two reasons. First, in real life, healthcare professionals make repeated, sequential choices in their work rather than one-time decisions, as in Experiment 1. It was therefore appropriate to simulate a repeated decision-making environment. Second, our first study recruited a hard-to-reach sample of healthcare professionals, nearly exhausting the relevant Prolific participant pool in the target countries over several months. Reusing this pool allowed us to ensure comparability, replicate the first study, examine repeated decision-making, and achieve an adequate sample size within a reasonable timeframe, while the nearly one-year gap between the experiments minimized concerns about carryover effects.

All participants provided informed consent. Following the recording of socio-demographic variables, participants first familiarized themselves with the adapted game structure and experimental setup. Participants were instructed to read the instructions carefully, noting that, although they had participated in a similar experiment before, significant changes had been made. To facilitate understanding of the adapted game structure with explicit collective costs, two illustrative examples were provided. Participants were then asked to specify which choice was associated with collective costs and which individuals were affected by the collective costs. Afterward, participants engaged in one round of the adapted Moral Wiggle Room task. To record qualitative information on healthcare professionals' reasoning for their prescribing decision, participants were then asked to retrospectively describe their rationale when making their choice.

2.2. Results

Under diagnostic certainty in the full information condition, 12% prescribed antibiotics immediately. When faced with diagnostic uncertainty and choosing not to reduce it in the hidden information condition, 24% of healthcare professionals opted for immediate prescribing. Hence, when making the social externalities of antibiotic prescribing salient in Experiment 2 (Fig. 3B), immediate prescribing declined across conditions compared to when the collective costs were incorporated rather implicitly in the payoff structure as in Experiment 1 (Fig. 3A).

2.2.1. Preregistered analyses

To examine willful ignorance, the fraction of choices to restrain prescribing under diagnostic certainty was compared to the fraction of restrained prescribing choices under diagnostic uncertainty (when not reduced, including the state of conflict and state of alignment in the hidden information condition). Although healthcare professionals had 2.26 times higher odds to restrain antibiotic prescribing when facing diagnostic certainty (88%, 44 out of 50 participants) than when facing diagnostic uncertainty (76%, 39 out of 51 participants), this difference was not statistically significant, $\chi^2(1) = 1.57$, $p = .210$, $OR = 2.26$, 95% CI [0.77, 6.58] (Fig. 3B, full information vs. hidden information). As preregistered, we reran the analysis excluding the states of alignment in the hidden information condition, yielding qualitatively the same result, $\chi^2(1) = 3.17$, $p = .075$, $OR = 3.45$, 95% CI [1.04, 11.43].

2.2.2. Exploratory analyses

When faced with initial diagnostic uncertainty, 49% of healthcare professionals (49 of 100 participants, pooled across state of conflict and state of alignment) decided to reveal the information. Results again revealed no significant evidence for the sorting effect, that is, more restrained prescribing choices when endogenously acquiring information in the hidden information condition (92%, 23 out of 25 participants) than when exogenously receiving it in the full information condition (88%, 44 out of 50 participants), $\chi^2(1) = .02$, $p = .894$, $OR = 0.64$, 95% CI [0.12, 3.41]. In addition, we explored the role of socio-demographic variables, and threat perception of antibiotic resistance on cooperative choices and information avoidance in the behavioral game. No secondary variable significantly predicted the likelihood of cooperative choices or information avoidance in our sample (see Table S8 and S9 in the supplementary material).

When asked about the rationales for their prescribing decisions, participants most often provided responses concerning collective responsibility (i.e., concerns for societal outcomes; $n = 54$), followed by antibiotic stewardship (i.e., emphasis on antibiotic stewardship practices; $n = 35$), patient concerns (i.e., concerns for the current patient; $n = 23$) and the need for diagnostic clarity (i.e., further understanding of the infection needed; $n = 21$, for rationales itemized by decisions, see Table S10 in the supplementary material).

When focusing on those healthcare professionals who participated in both experiments, the following pattern emerged: 88% restrained prescribing in cases of initial diagnostic certainty in Experiment 1, perfectly equivalent to Experiment 2. When faced with diagnostic uncertainty and choosing not to reduce it, about 44% restrained prescribing in Experiment 1, whereas about 76% restrained antibiotic prescribing in Experiment 2.[5]

Additional exploratory analyses were performed to investigate repeated decision-making. To this end, a mixed effects logistic regression model was specified with cooperative choices as the dependent variable (1 = restrained prescribing, 0 = immediate prescribing), including experiment (Experiment 1 vs. Experiment 2) and ambiguity (hidden information condition vs. full information condition) as fixed effects. The repeated measures structure was accounted for by specifying a random intercept for participants.

We investigated the willful ignorance effect pooled across the two experiments. To this end, we ran a mixed effects logistic regression model, including only observations from the full information condition, and both states of the world in the hidden information condition when not acquiring information. Results showed a significant effect of experiment (OR = 2.70, 95% CI [1.19, 6.15], p = .018) and ambiguity (OR = 0.18, 95% CI [0.07, 0.46], $p < .001$). The results suggest higher odds of restrained prescribing in Experiment 2 (vs. 1) averaged across observations. Additionally, consistent with the willful ignorance effect, the odds of restrained prescribing were lower in the hidden information condition when not reducing diagnostic uncertainty (vs. the full information condition).

We also included observations from the full information condition, from both states of the world in the hidden information condition when not acquiring information, and observations from the state of conflict when acquiring information in the hidden information condition. Results indicated a significant effect of experiment (OR = 2.74, 95% CI [1.38, 5.47], p = .004) and ambiguity (OR = 0.27, 95% CI [0.12, 0.59], p = .001), indicating that the odds of restrained prescribing were higher in Experiment 2 (vs. 1) and in cases of initial diagnostic certainty (vs. uncertainty).

2.3. Discussion

In Experiment 2, immediate antibiotic prescribing reduced substantially across conditions, yielding the willful ignorance effect not statistically significant. This suggests that already simple interventions such as making the collective costs of immediate antibiotic prescribing salient can substantially reduce willful ignorance. The analyses further indicate that immediate prescribing was less likely regardless of whether participants chose to reduce diagnostic uncertainty.

3. General discussion

Healthcare professionals often face diagnostic uncertainty when deciding whether or not to prescribe antibiotics (Wang et al., 2021). Diagnostic uncertainty, particularly in socially complex situations, makes prescribing decisions more susceptible to short-term interests, such as satisfying perceived patient expectations (Coenen et al., 2006; Cole, 2014; Sirota et al., 2017) and reputational concerns (Broom et al., 2017; Krockow et al., 2019). In this work, we propose that in such cases, healthcare professionals may avoid information about the consequences of their treatment decision – a behavior known as willful ignorance (Dana et al., 2007; Grossman & van der Weele, 2017; Hertwig & Engel, 2016) – to justify immediate antibiotic prescribing.

To test this idea, we adapted a well-established behavioral game (Dana et al., 2007) to examine the role of willful ignorance in antibiotic prescribing. In Experiment 1, we found strong evidence that willful ignorance can facilitate immediate antibiotic prescribing, revealing one potentially important psychological mechanism underlying overprescription. This finding aligns well with prior research across various domains showing that individuals often avoid information about the consequences of their actions, leading to more self-interested choices and reduced cooperative behavior (Vu et al., 2023). This is important behavioral evidence demonstrating the detrimental effects of willful ignorance on appropriate antibiotic prescribing.

In Experiment 2, the addition of transparently communicating about the collective costs of each antibiotic prescription mitigated this effect. Importantly, unlike the patient-specific consequences, information about the social externalities on the collective was presented in all conditions and was therefore salient even in the hidden information condition. This is further supported by the open-response rationales provided by healthcare professionals, in which collective responsibility was identified as the most common reason. Although these costs were very small for both the decision-maker and the patient – leaving the incentive structure essentially unchanged – this information was sufficient to reduce immediate prescribing across conditions.

Across both experiments, the results did not provide support for the sorting effect, namely more cooperative choices when voluntarily acquiring information in the hidden information condition compared to information by default in the full information condition, as proposed by Grossman and van der Weele (2017). Instead, in Experiment 1 healthcare professionals who voluntarily sought information about the consequences of their decision (i.e., who actively sorted themselves into the state of having full information) were less likely to restrain prescribing compared to those who received the same information from the onset by default. Although the sorting effect has been supported by meta-analytical evidence, it has been found to be much smaller and less consistent in prior research in comparison to willful ignorance (see Vu et al., 2023, for a detailed overview). A possible explanation for the observed lack of the sorting effect is that in Experiment 1, about 66% revealed information in the hidden information condition, higher than the level of information acquisition observed across the meta-analytical sample (about 60%; Vu et al., 2023). It is conceivable that the acquisition of information was not solely driven by prosocial motives but instead reflects a professional default of healthcare professionals to reduce diagnostic uncertainty. Yet, exploratory sorting analyses for Experiment 1 suggested that healthcare professionals who willfully ignored information were significantly less likely to restrain prescribing than those who endogenously selected to acquire information about the consequences of their actions. In line with previous research (Vu et al., 2024), this provides some evidence for a self-selection process aligned with social preferences. In Experiment 2, healthcare professionals descriptively made more choices to restrain prescribing when endogenously deciding to acquire information compared to those who received this information by default. However, this difference was not statistically significant, which could be attributed to the small sample size in Experiment 2. Notably, the percentage of participants who chose to acquire information under initial diagnostic uncertainty (i.e., 49%) was lower than in Experiment 1. Making the collective cost of antibiotic use salient to all participants, irrespective of condition, may have lowered the perceived informational value of revealing under diagnostic uncertainty.

3.1. Limitations and future directions

Despite the strengths of using a behavioral game adapted to a real-world context, several limitations should be noted. Firstly, the behavioral game only represents a simplified version of reality (Thielmann

[5] To address self-selection in Experiment 2, we conducted a descriptive subgroup analysis comparing healthcare professionals who only participated in Experiment 1 but not in Experiment 2, with those participating both in Experiment 1 and 2. The pattern of choices shows willful ignorance across both subsamples, but in Experiment 1 this effect is descriptively larger among healthcare professionals who took part in both experiments as compared to those who took only part in Experiment 1. In detail, under diagnostic certainty in Experiment 1, 72% of healthcare professionals who only participated in Experiment 1 restrained prescribing, while 88% of healthcare professionals who participated in Experiment 1 and Experiment 2 restrained prescribing. Under diagnostic uncertainty in Experiment 1 and choosing not to resolve it, 43% of healthcare professionals who only participated in Experiment 1 restrained prescribing, while 44% of healthcare professionals who participated in Experiment 1 and Experiment 2 restrained prescribing.

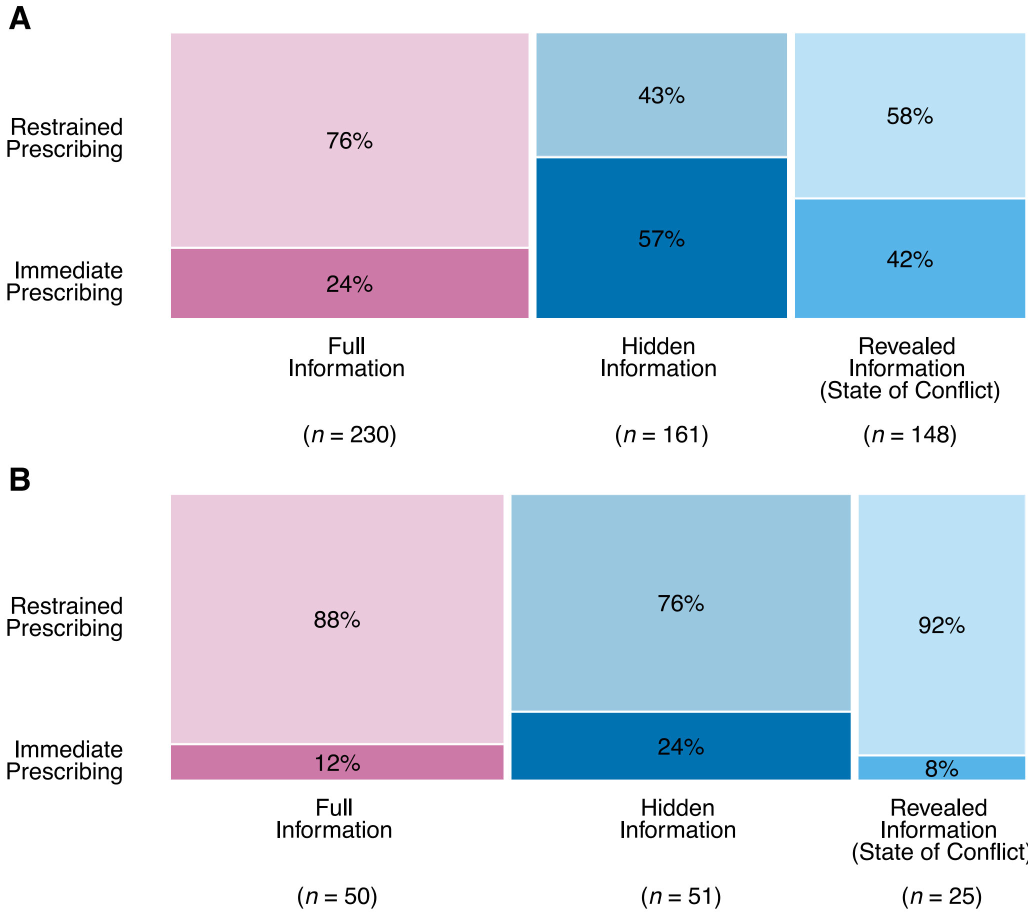

Fig. 3. Mosaic plot of the distribution of choices in Experiment 1 (A) and Experiment 2 (B).
Note. Full information represents all observations of participants in the full information condition. Hidden information represents all observations of participants in the hidden information condition who did not acquire information. Revealed information represents all observations of participants in the hidden information – state of conflict condition who chose to reveal information; observations of participants in which having revealed the information led to the state of alignment are excluded. The width of the rectangles on the horizontal axis is proportional to the number of observations in each information condition. The vertical length of the bars is proportional to the percentage of immediate and restrained prescribing choices, respectively, within each information condition.

et al., 2021): healthcare environments, real-world decision options, and patient symptoms are often more complex than depicted in our experiments. To reduce complexity in our game setting, we have depicted the states of the world as binary; either presenting healthcare professionals with diagnostic certainty or diagnostic uncertainty. Yet, near-patient testing, such as point-of-care tests do not provide perfect diagnostic certainty, presenting a rather continuous spectrum between diagnostic uncertainty and certainty. Nevertheless, the present study provides important findings on the phenomenon of willful ignorance with a pertinent sample of healthcare professionals in a hypothetical prescribing context. To ensure perceived plausibility of the scenario, monetary point allocation and choice rationales were validated by healthcare professionals, underpinning the ecological validity of the findings. Going forward, future work should aim to link choices made in the behavioral game setting with consequential choices made in healthcare environments in the field (Galizzi & Wiesen, 2018).

Secondly, across our experiments, the allocation to information conditions was exogenously determined. A promising future direction is to explore decisions under endogenous institutional choice (Gürerk et al., 2006; Iacono et al., 2023; Meier et al., 2020), in which healthcare professionals themselves can endogenously decide whether to receive diagnostic certainty upfront or initially start with diagnostic uncertainty and the option to actively reduce it or investigate ignorance rates about the consequences of actions after having revealed their choice in the full information condition (for this approach, see Grossman & van der Weele, 2017).

Lastly, it has been posited that one potential way to mitigate willful ignorance is by altering the payoff structure for information acquisition (Vu et al., 2023). In our experimental setup, diagnostic uncertainty could be reduced at no cost, which might have artificially lowered the barrier for information acquisition compared to real-life situations. However, acquiring new information by conducting further diagnostic testing comes with both psychological and resource costs for healthcare professionals and patients. Introducing a subsidization for reducing diagnostic uncertainty could incentivize information acquisition, potentially fostering more cooperative decision-making. Future work could simulate a setting closer to the real-world context by implementing latency before revealing the payoffs for the patient, imposing a monetary cost for revealing information, or a combination of both. It would be conceivable that introducing information cost would increase the effect of willful ignorance by providing a further rationale to remain willfully ignorant before making the decision.

3.2. Implications

From a policy perspective, the current findings underline the potential value of designing healthcare environments that reduce opportunities for information avoidance and increase the communication about collective costs. Several strategies are conceivable. These include implementing best practice protocols that encourage diagnostic checks and antibiotic use reporting and incentivizing further diagnostic testing. Based on the findings from Experiment 2, another promising and feasible intervention strategy for everyday clinical practice to reduce willful ignorance in antibiotic prescribing contexts is to emphasize how one's prescribing affects the collective. Additional leverages could involve mandating justification for not conducting further diagnostic testing or introducing mandatory diagnostic testing prior to antibiotic prescribing in cases of diagnostic uncertainty. While presenting a solution to reduce overprescription, the implementation of such system-level policies should be subject to careful consideration to avoid potential negative consequences, such as psychological reactance (see also Granulo et al., 2025). Despite their potential societal benefits, this highlights the importance of empirically assessing the short- and long-term behavioral consequences of such policies.

3.3. Conclusion

This study aims to better understand the effect of willful ignorance on prescribing decisions of healthcare professionals. It provides behavioral evidence of willful ignorance in the context of antibiotic prescribing under diagnostic uncertainty. The findings indicate that when the social externalities of antibiotic use are not saliently communicated, healthcare professionals willfully avoid information about the consequences of their treatment decision, resulting in more inappropriate antibiotic prescribing. By emphasizing how antibiotic prescribing accelerates antibiotic resistance and imposes costs on society, willful ignorance can be mitigated. Therefore, decision-making environments should prioritize transparency and communicate the collective costs of antibiotic use to ensure that individuals cannot disregard the consequences of their own decisions.

3.4. Open practices

All experiments, measures, manipulations, and data/participant exclusions are reported in the manuscript or the supplementary material. The study was preregistered (Experiment 1: https://osf.io/gj3ym, Experiment 2: https://osf.io/fxwnm). The data, analysis code, and study materials are provided via the Open Science Framework (OSF) (https://osf.io/sa4eq). All analyses were carried out in R (R. Core Team, 2025).

CRediT authorship contribution statement

Alina Schneider: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Miroslav Sirota:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Rian Gross:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Lars Korn:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Elisabeth D.C. Sievert:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Cornelia Betsch:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Robert Böhm:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used GPT-4 in order to language edit the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors would like to thank the participants of the 3rd Behavioural Insights and Antimicrobial Resistance Workshop and the 10th Workshop in Behavioral and Experimental Health Economics for helpful discussions. We are grateful to Hannah Daniela Obertautsch for acting as second rater for the open-ended responses.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jesp.2026.104965.

Data availability

The data, analysis code, and study materials are provided via the Open Science Framework.

References

Anthony, W. E., Wang, B., Sukhum, K. V., D'Souza, A. W., Hink, T., Cass, C., Seiler, S., Reske, K. A., Coon, C., Dubberke, E. R., Burnham, C.-A. D., Dantas, G., & Kwon, J. H. (2022). Acute and persistent effects of commonly used antibiotics on the gut microbiome and resistome in healthy adults. *Cell Reports*, *39*(2), Article 110649. http://dx.doi.org/10.1016/j.celrep.2022.110649, URL https://www.sciencedirect.com/science/article/pii/S2211124722004016.

Bayot, M. L., & Bragg, B. N. (2024). *Antimicrobial Susceptibility Testing*. Treasure Island (FL): StatPearls Publishing, URL http://www.ncbi.nlm.nih.gov/books/NBK539714/.

Böhm, R., Holtmann-Klenner, C., Korn, L., Santana, A. P., & Betsch, C. (2022). Behavioral determinants of antibiotic resistance: The role of social information. *Applied Psychology: Health and Well-Being*, *14*(3), 757–775. http://dx.doi.org/10.1111/aphw.12345, URL https://iaap-journals.onlinelibrary.wiley.com/doi/10.1111/aphw.12345.

Broom, A., Kirby, E., Gibson, A. F., Post, J. J., & Broom, J. (2017). Myth, manners, and medical ritual: defensive medicine and the fetish of antibiotics. *Qualitative Health Research*, *27*(13), 1994–2005. http://dx.doi.org/10.1177/1049732317721478, URL https://doi.org/10.1177/1049732317721478.

Bulus, M., & Jentschke, S. (2025). Pwrss: Statistical Power and Sample Size Calculation Tools. URL https://cran.r-project.org/web/packages/pwrss/index.html.

Cals, J. W. L., Boumans, D., Lardinois, R. J. M., Gonzales, R., Hopstaken, R. M., Butler, C. C., & Dinant, G.-J. (2007). Public beliefs on antibiotics and respiratory tract infections: an internet-based questionnaire study. *British Journal of General Practice*, *57*(545), 942–947. http://dx.doi.org/10.3399/096016407782605027.

Carrara, E., Pfeffer, I., Zusman, O., Leibovici, L., & Paul, M. (2018). Determinants of inappropriate empirical antibiotic treatment: systematic review and meta-analysis. *International Journal of Antimicrobial Agents*, *51*(4), 548–553. http://dx.doi.org/10.1016/j.ijantimicag.2017.12.013, URL https://linkinghub.elsevier.com/retrieve/pii/S0924857917304478.

Charness, G., Gneezy, U., & Rasocha, V. (2021). Experimental methods: Eliciting beliefs. *Journal of Economic Behavior and Organization*, *189*, 234–256. http://dx.doi.org/10.1016/j.jebo.2021.06.032, URL https://www.sciencedirect.com/science/article/pii/S0167268121002717.

Coenen, S., Michiels, B., Renard, D., Denekens, J., & Van Royen, P. (2006). Antibiotic prescribing for acute cough: the effect of perceived patient demand. *British Journal of General Practice*, *56*(524), 183–190.

Cole, A. (2014). GPs feel pressurised to prescribe unnecessary antibiotics, survey finds. *BMJ (Clinical Research Ed.)*, *349*, g5238. http://dx.doi.org/10.1136/bmj.g5238.

Costelloe, C., Metcalfe, C., Lovering, A., Mant, D., & Hay, A. D. (2010). Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis. *BMJ*, *340*, c2096. http://dx.doi.org/10.1136/bmj.c2096, URL https://www.bmj.com/content/340/bmj.c2096.

Dana, J., Weber, R. A., & Kuang, J. X. (2007). Exploiting moral wiggle room: experiments demonstrating an illusory preference for fairness. *Economic Theory*, *33*(1), 67–80. http://dx.doi.org/10.1007/s00199-006-0153-z, URL https://doi.org/10.1007/s00199-006-0153-z.

Galizzi, M. M., & Wiesen, D. (2018). Behavioral experiments in health economics. In *Oxford research encyclopedia of economics and finance*. Oxford University Press, http://dx.doi.org/10.1093/acrefore/9780190625979.013.244, URL https://oxfordre.com/economics/display/10.1093/acrefore/9780190625979.001.0001/acrefore-9780190625979-e-244.

Goldschmidt, E., Rannon, E., Bernstein, D., Wasserman, A., Roimi, M., Shrot, A., Coster, D., & Shamir, R. (2025). Predicting appropriateness of antibiotic treatment among ICU patients with hospital-acquired infection. *Npj Digital Medicine*, *8*(1), 1–16. http://dx.doi.org/10.1038/s41746-024-01426-9, URL https://www.nature.com/articles/s41746-024-01426-9.

Granulo, A., Fuchs, C., & Böhm, R. (2025). Psychological reactance to system-level policies before and after their implementation. *Proceedings of the National Academy of Sciences*, *122*(18), Article e2409907122. http://dx.doi.org/10.1073/pnas.2409907122, URL https://www.pnas.org/doi/abs/10.1073/pnas.2409907122.

Grossman, Z., & van der Weele, J. J. (2017). Self-image and willful ignorance in social decisions. *Journal of the European Economic Association*, *15*(1), 173–217. http://dx.doi.org/10.1093/jeea/jvw001, URL https://doi.org/10.1093/jeea/jvw001.

Gürerk, Ö., Irlenbusch, B., & Rockenbach, B. (2006). The competitive advantage of sanctioning institutions. *Science*, *312*(5770), 108–111. http://dx.doi.org/10.1126/science.1123633, URL https://www-science-org.uaccess.univie.ac.at/doi/10.1126/science.1123633.

Hertwig, R., & Engel, C. (2016). Homo ignorans: Deliberately choosing not to know. *Perspectives on Psychological Science*, *11*(3), 359–372. http://dx.doi.org/10.1177/1745691616635594.

Hibbard, R., Mendelson, M., Page, S. W., Ferreira, J. P., Pulcini, C., Paul, M. C., & Faverjon, C. (2024). Antimicrobial stewardship: a definition with a One Health perspective. *Npj Antimicrobials and Resistance*, *2*(1), 15. http://dx.doi.org/10.1038/s44259-024-00031-w, URL https://www.nature.com/articles/s44259-024-00031-w.

Hou, K., Wu, Z.-X., Chen, X.-Y., Wang, J.-Q., Zhang, D., Xiao, C., Zhu, D., Koya, J. B., Wei, L., Li, J., & Chen, Z.-S. (2022). Microbiota in health and diseases. *Signal Transduction and Targeted Therapy*, *7*(1), 135. http://dx.doi.org/10.1038/s41392-022-00974-4, URL https://www.nature.com/articles/s41392-022-00974-4.

Krockow, E. M., Colman, A. M., Chattoe-Brown, E., Jenkins, D. R., Perera, N., Mehtar, S., & Tarrant, C. (2019). Balancing the risks to individual and society: a systematic review and synthesis of qualitative research on antibiotic prescribing behaviour in hospitals. *Journal of Hospital Infection*, *101*(4), 428–439. http://dx.doi.org/10.1016/j.jhin.2018.08.007, URL https://www.journalofhospitalinfection.com/article/S0195-6701(18)30418-3/fulltext.

Krockow, E. M., Patel, S., & Roland, D. (2023). Decision challenges for managing acute paediatric infections: implications for antimicrobial resistance. *Antibiotics*, *12*(5), 828. http://dx.doi.org/10.3390/antibiotics12050828, Number: 5. URL https://www.mdpi.com/2079-6382/12/5/828.

Krockow, E. M., Tarrant, C., & Colman, A. M. (2022). Prosociality in the social dilemma of antibiotic prescribing. *Current Opinion in Psychology*, *44*, 164–169. http://dx.doi.org/10.1016/j.copsyc.2021.09.007, URL https://www.sciencedirect.com/science/article/pii/S2352250X21001767.

Leiner, D. J. (2024). SoSci Survey. URL https://www.soscisurvey.de.

Lo Iacono, S., Przepiorka, W., Buskens, V., Corten, R., van Assen, M., & van de Rijt, A. (2023). The competitive advantage of sanctioning institutions revisited: A multilab replication. *PNAS Nexus*, *2*(5), pgad091. http://dx.doi.org/10.1093/pnasnexus/pgad091, URL https://doi.org/10.1093/pnasnexus/pgad091.

Macfarlane, J., Lewis, S. A., Macfarlane, R., & Holmes, W. (1997). Contemporary use of antibiotics in 1089 adults presenting with acute lower respiratory tract illness in general practice in the U.K.: implications for developing management guidelines. *Respiratory Medicine*, *91*(7), 427–434. http://dx.doi.org/10.1016/s0954-6111(97)90258-4.

Matthey, A., & Regner, T. (2011). Do I really want to know? A cognitive dissonance-based explanation of other-regarding behavior. *Games*, *2*(1), 114–135. http://dx.doi.org/10.3390/g2010114, URL https://www.mdpi.com/2073-4336/2/1/114.

McDonnell, A., Countryman, A., Laurence, T., Gulliver, S., Drake, T., Edwards, S., Kenny, C., Lamberti, O., Morton, A., Shafira, A., Smith, R., & Guzman, J. (2024). *Forecasting the fallout from AMR: economic impacts of antimicrobial resistance in humans*: *A report from the EcoAMR series*, Paris (France) and Washington, DC (United States of America): World Organisation for Animal Health and World Bank, URL https://doi.org/10.20506/ecoAMR.3539.

Meerza, S. I. A., Brooks, K. R., Gustafson, C. R., & Yiannaka, A. (2021). Information avoidance behavior: Does ignorance keep us uninformed about antimicrobial resistance? *Food Policy*, *102*, Article 102067. http://dx.doi.org/10.1016/j.foodpol.2021.102067, URL https://www.sciencedirect.com/science/article/pii/S0306919221000440.

Meier, N. W., Böhm, R., Korn, L., & Betsch, C. (2020). Individual preferences for voluntary vs. mandatory vaccination policies: an experimental analysis. *European Journal of Public Health*, *30*(1), 50–55. http://dx.doi.org/10.1093/eurpub/ckz181, URL https://doi.org/10.1093/eurpub/ckz181.

Murphy, R., Ahern, E., Deegan, A., Hogan, K., Kelly, A., Reidy, J., McMahon, G., & Muldoon, O. (2024). Changing behaviour: reducing unnecessary antibiotic prescribing. a systematic review and meta-analysis. URL http://hdl.handle.net/10147/642844.

Naghavi, M., Vollset, S. E., Ikuta, K. S., Swetschinski, L. R., Gray, A. P., Wool, E. E., Aguilar, G. R., Mestrovic, T., Smith, G., Han, C., Hsu, R. L., Chalek, J., Araki, D. T., Chung, E., Raggi, C., Hayoon, A. G., Weaver, N. D., Lindstedt, P. A., Smith, A. E., ... Murray, C. J. L. (2024). Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050. *Lancet*, *404*(10459), 1199–1226. http://dx.doi.org/10.1016/S0140-6736(24)01867-1, URL https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(24)01867-1/fulltext.

R. Core Team (2025). R: A language and environment for statistical computing. URL https://www.R-project.org/.

Reszetnik, G., Hammond, K., Mahshid, S., AbdElFatah, T., Nguyen, D., Corsini, R., Caya, C., Papenburg, J., Cheng, M. P., & Yansouni, C. P. (2024). Next-generation rapid phenotypic antimicrobial susceptibility testing. *Nature Communications*, *15*(1), 9719. http://dx.doi.org/10.1038/s41467-024-53930-x, URL https://www.nature.com/articles/s41467-024-53930-x.

Roope, L. S. J., Smith, R. D., Pouwels, K. B., Buchanan, J., Abel, L., Eibich, P., Butler, C. C., Tan, P. S., Walker, A. S., Robotham, J. V., & Wordsworth, S. (2019). The challenge of antimicrobial resistance: What economics can contribute. *Science*, *364*(6435), eaau4679. http://dx.doi.org/10.1126/science.aau4679, URL https://www.science.org/doi/10.1126/science.aau4679.

Santana, A. P., Korn, L., Betsch, C., & Böhm, R. (2023). Promoting prosociality toward future generations in antibiotic intake. *Journal of Health Psychology*, *28*(11), 1024–1037. http://dx.doi.org/10.1177/13591053221149526, URL https://doi.org/10.1177/13591053221149526.

Santana, A. P., Korn, L., Betsch, C., Krockow, E. M., Sievert, E. D. C., Gross, M., Pepper, M., & Böhm, R. (2024). Understanding and reducing inappropriate antibiotic use in the context of delayed prescriptions. *Health Psychology*, *43*(3), 194–202. http://dx.doi.org/10.1037/hea0001323, URL https://doi.apa.org/doi/10.1037/hea0001323.

Sirota, M., Round, T., Samaranayaka, S., & Kostopoulou, O. (2017). Expectations for antibiotics increase their prescribing: Causal evidence about localized impact. *Health Psychology*, *36*(4), 402–409. http://dx.doi.org/10.1037/hea0000456.

Sweeny, K., & Howell, J. L. (2025). Managing acute uncertainty. In C. Patrick J., K. Rios, & K. C. Oleson (Eds.), *Routledge international handbooks*, *The routledge handbook of the uncertain self* (2nd ed.). (pp. 283–302). New York, NY: Routledge.

Sweeny, K., Melnyk, D., Miller, W., & Shepperd, J. A. (2010). Information avoidance: Who, what, when, and why. *Review of General Psychology*, *14*(4), 340–353. http://dx.doi.org/10.1037/a0021288, URL https://doi.org/10.1037/a0021288.

Thielmann, I., Böhm, R., Ott, M., & Hilbig, B. E. (2021). Economic games: an introduction and guide for research. *Collabra: Psychology*, *7*(1), 19004. http://dx.doi.org/10.1525/collabra.19004, URL https://doi.org/10.1525/collabra.19004.

Vu, L., Molho, C., Soraperra, I., Fiedler, S., & Shalvi, S. (2024). Giving (in) to help an identified person. *Journal of Experimental Social Psychology*, *110*, Article 104557. http://dx.doi.org/10.1016/j.jesp.2023.104557, URL https://www.sciencedirect.com/science/article/pii/S0022103123001142.

Vu, L., Soraperra, I., Leib, M., van der Weele, J., & Shalvi, S. (2023). Ignorance by choice: A meta-analytic review of the underlying motives of willful ignorance and its consequences. *Psychological Bulletin*, *149*(9–10), 611–635. http://dx.doi.org/10.1037/bul0000398.

Wang, D., Liu, C., Zhang, X., & Liu, C. (2021). Does diagnostic uncertainty increase antibiotic prescribing in primary care? *Npj Primary Care Respiratory Medicine*, *31*(1), 1–7. http://dx.doi.org/10.1038/s41533-021-00229-9, URL https://www.nature.com/articles/s41533-021-00229-9.

World Health Organization (2023). Antimicrobial resistance. URL https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance.